

DRAWINGS ATTACHED.

961,653

*Date of Application and filing Complete Specification :**April 23, 1963.**No. 15939/63.**Application made in Sweden (No. 7004) on June 21, 1962.**Complete Specification Published : June 24, 1964.*

© Crown Copyright 1964.

Index at Acceptance :—B7 H(A2E, C10F, C16).

International Classification :—B 62 d.

## COMPLETE SPECIFICATION.

## Improvements in Articulated Four-Wheel Drive Vehicles.

We, AKTIEBOLAGET LANDSVERK, a Swedish Joint Stock Company, of Landskrona, Sweden, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to an improvement in the steering of articulated vehicles with a four-wheel drive, for instance tractors and similar vehicles, principally consisting of a front section and a rear section, which sections are pivoted around a substantially vertical axis and form an angle with one another when the vehicle is steered. The steering is usually achieved by the aid of hydraulic cylinders. The front and rear sections are each supported by a wheel axle with driving means for the wheels. The power source of the vehicle is usually mounted on the rear section and drives, in addition to the wheel axle of the rear section, also a driving shaft directed towards the front section and in its turn is adapted to transfer driving power to the wheel axle of the front section by the aid of a driving shaft directed towards the rear section and pivotally connected to the driving shaft directed towards the front section. The method hitherto used for the transmission of the driving power from the driving shaft end of the rear section of the vehicle to the driving shaft of the front section comprises the use of so-called universal joints of different types and designs connected to the appropriate driving shafts and also are connected to one another. All these universal joints cause very great disadvantages, of which the main one is that the angle during steering is very limited (the maximal angle is about 30°). Further disadvantages

are that the wear of the universal joints at maximum angle is very great and that the turning movement will be very uneven because it follows a sine curve. 45

The object of the present invention is to eliminate said disadvantages by replacing the universal joints by a bevelled gearing transmission, mainly consisting of two pairs of bevelled gears. One gear of one pair is mounted on the rear driving shaft and drives the front driving shaft and simultaneously permits a change of the angle between the two driving shafts on steering of the vehicle. Said gear drives a second bevelled gear of the same pair, which is mounted on a shaft substantially perpendicular to the plane of the two driving shafts on normal driving and preferably extending through the point of intersection of the center lines of the front and rear sections. A bevelled gear of the second pair fixed to the opposite end of said perpendicular shaft in its turn drives a fourth bevelled gear belonging to the latter pair and fixed to the driving shaft of the front section. Thus the rear driving shaft will drive the front one through the bevelled gearing, which permits a mutual angular motion between the center lines of the two driving shafts. Each pair of gears is encased in a separate casing and said casings are free to move angularly relative to one another on steering the vehicle. At its two outer ends the perpendicular shaft is journaled to rotate either in the frame of the front section or in the frame of the rear section of the vehicle and is rotatably journaled in the frame of the other section, thus enabling the two wheel axles to be set at an angle to one another on driving the vehicle on uneven ground. 75 80

The casings are filled with oil or grease and are freely movable in relation to one another on steering vehicle. The two cas- 85

ings may be made oil-tight in a simple manner.

One embodiment of the invention is shown in the accompanying drawing, in which:—

Fig. 1 diagrammatically shows a side view of a four-wheel driven pivot-steered vehicle, partly in section; and

Fig. 2 shows a plan view of the same; whereas

Fig. 3 illustrates the gearing transmission in section on a larger scale.

Figs. 1 and 2 show a loading machine, a front frame 1a with front wheels 1 and a rear frame 2a with rear wheels 2. At the front section of the vehicle there is a bucket or excavating unit 3 and at the rear section of the vehicle there is a driving engine 4. The engine drives the rear wheel axle directly and via a gear 5 (described below) the engine also drives the front wheel axle. In order to enable the aforesaid pivot-steering the gearing 5 is arranged so as to permit the front frame 1a to be set in an arbitrary angle to the rear frame 2a for the purpose of steering the vehicle simultaneously with the transmission of power. As an example, Fig. 2 shows in dash and dot lines, that the front frame has been pivoted at an angle of 45° to one side, but pivoting at an angle as great as 90° is possible in both directions. The power necessary for the steering may, for instance, be supplied from a suitable hydraulic power source.

From the engine or the rear axle a shaft 6 extends forwardly in the longitudinal direction of the vehicle, and is journalled at 7 in the rear frame 2a. At its end the shaft 6 carries a bevelled gear 8 secured to the shaft and meshing with a second gear 9 mounted perpendicularly to the first gear 8 and driving a vertical shaft 10, which at its opposite end carries a bevelled gear 11, in its turn meshing with a further bevelled gear 12, fixed to a front longitudinal shaft 13, which extends to the front wheel axle so as to drive the latter.

An important feature of the invention is that the gearing described comprises two independent casings sealed separately and filled with oil or other lubricant. The casing 14 (Fig. 3) of one pair of gears 8, 9 has for instance approximately the shape of a converted L and the casing 15 is arranged partly inside said L and encloses the second pair of gears 11, 12. It is easy to seal said

casings since it is only necessary to provide for sealing the rotating shafts 6, 13 and 10 respectively. The casings 14, 15 can be turned or pivoted in relation to one another when the vehicle is steered.

The rear frame 2a and the front frame 1a are pivotably connected to one another by means of stub shafts 16. On driving the vehicle on uneven ground the front and the rear axle may thus be set at an angle in relation to one another. It is possible with advantage to make sharp turns in narrow spaces on account of the fact that the front frame 1a with the front wheels can be set at a desired angle to the rear frame 2a carrying the rear wheels.

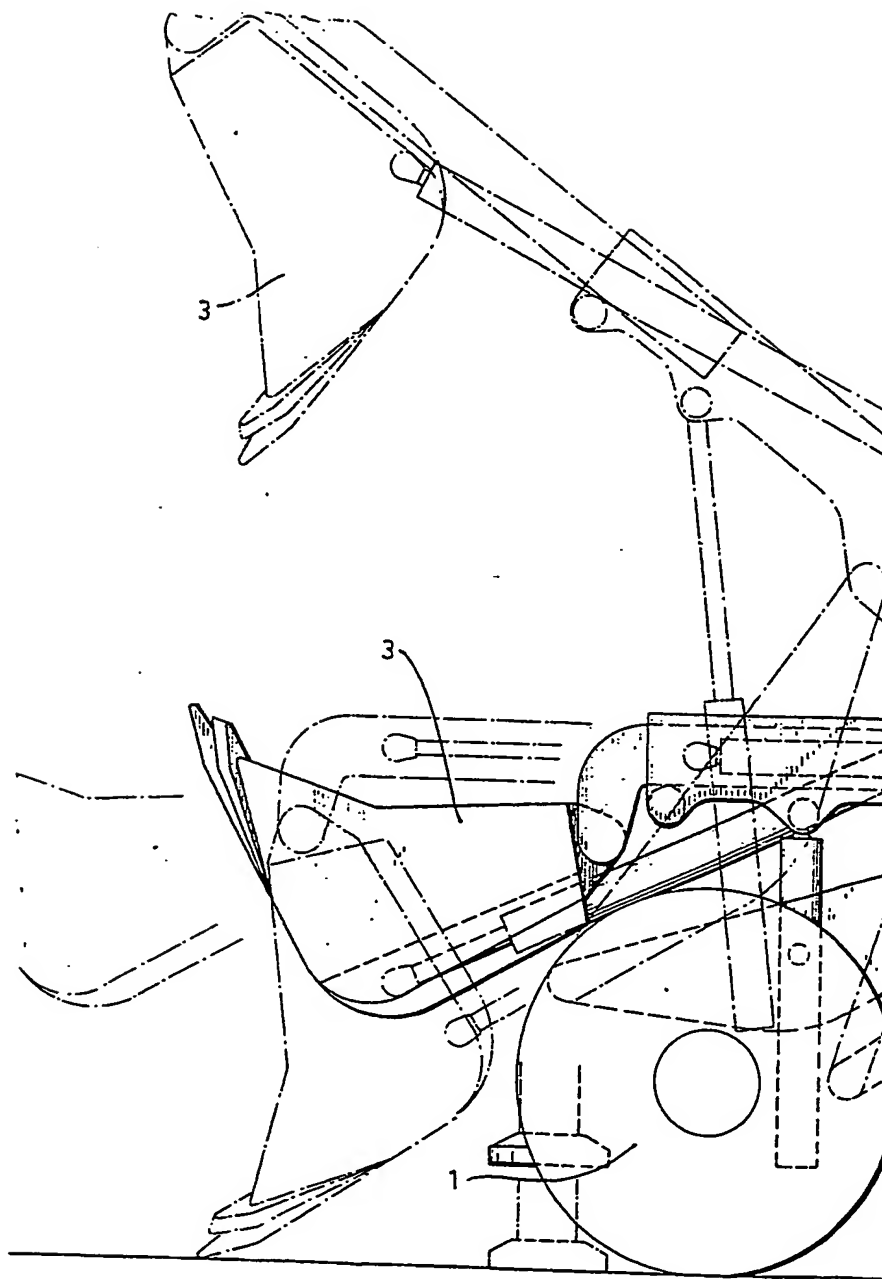
#### WHAT WE CLAIM IS:—

1. An arrangement in articulated four-wheel drive vehicles comprising a front section and a rear section, which are adapted to pivot in relation to one another about a substantially vertical axis, an engine or other source of power on one of said sections for driving the vehicle wheels of said section and also the vehicle wheels of the second section through a longitudinal shaft transmission comprising a front driving shaft and a rear driving shaft and a gearing mounted at said axis and comprising two pairs of engaging bevelled gears, which while effecting transmission of power permit change of the angle between said driving shafts of said front and the rear sections of the vehicle, characterised in that each pair of gears is encased in a separate casing, said casings being angularly movable in relation to one another around the substantially vertical axis on steering the vehicle about said axis.

2. An arrangement according to Claim 1, characterised by the fact that one of said casings, for instance in the shape of an L, partly surrounds the second casing.

3. An arrangement in articulated four-wheel drive vehicles substantially as herein described with reference to the accompanying drawings.

A. A. THORNTON & CO.,  
Chartered Patent Agents,  
Northumberland House,  
303/306 High Holborn,  
London, W.C.1,  
For the Applicants.



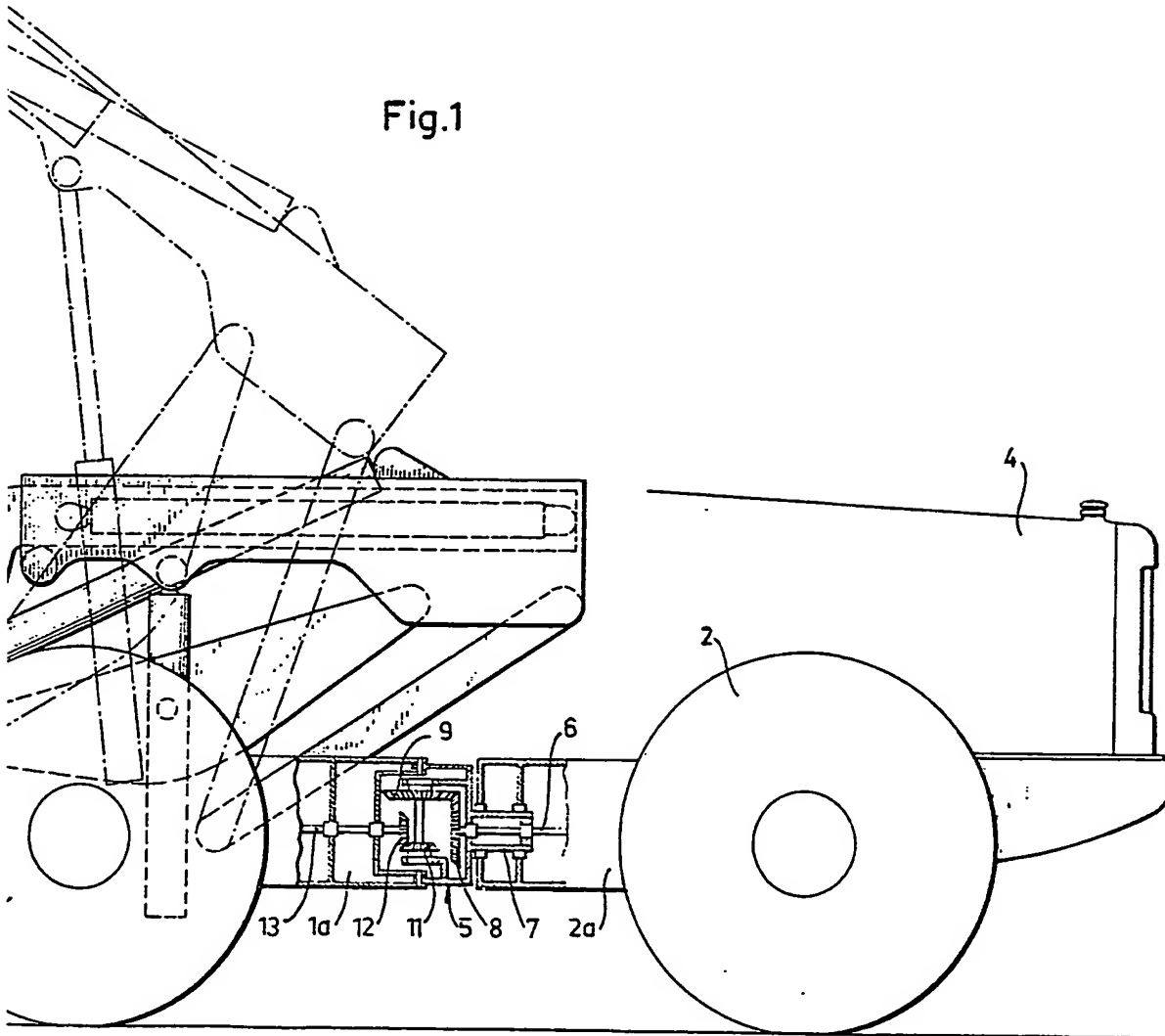
961653

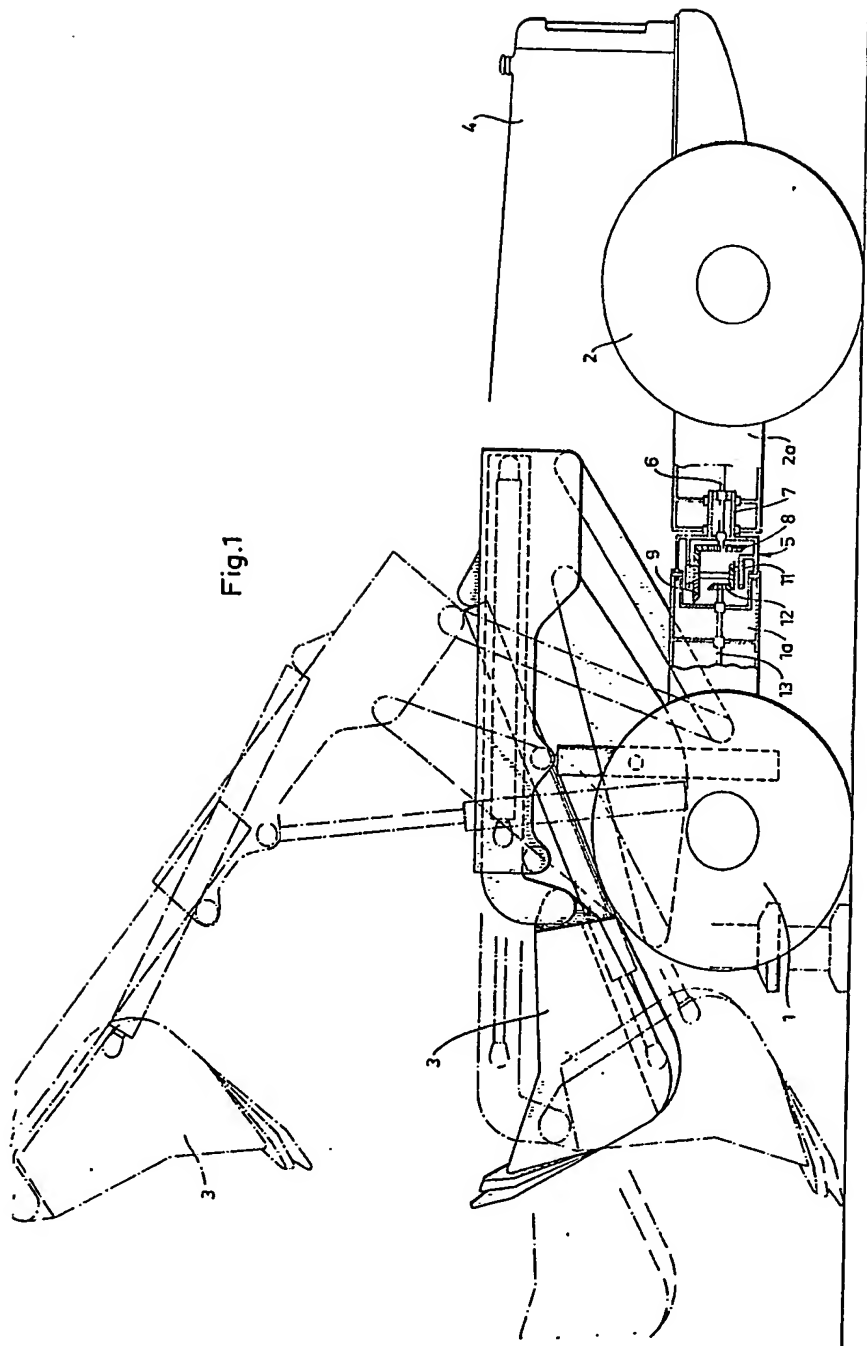
COMPLETE SPECIFICATION

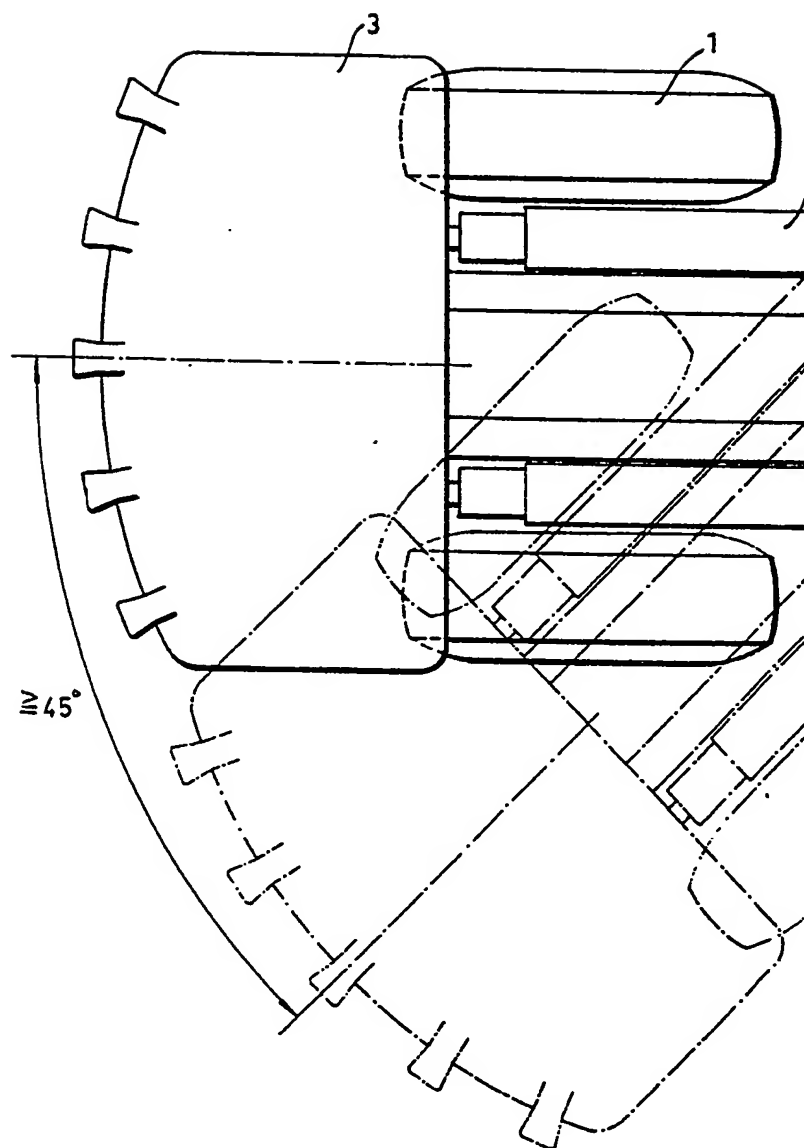
3 SHEETS

*This drawing is a reproduction of  
the Original on a reduced scale  
Sheet 1*

Fig.1







961653

COMPLETE SPECIFICATION

3 SHEETS

*This drawing is a reproduction of  
the Original on a reduced scale*

Sheet 2

Fig.2

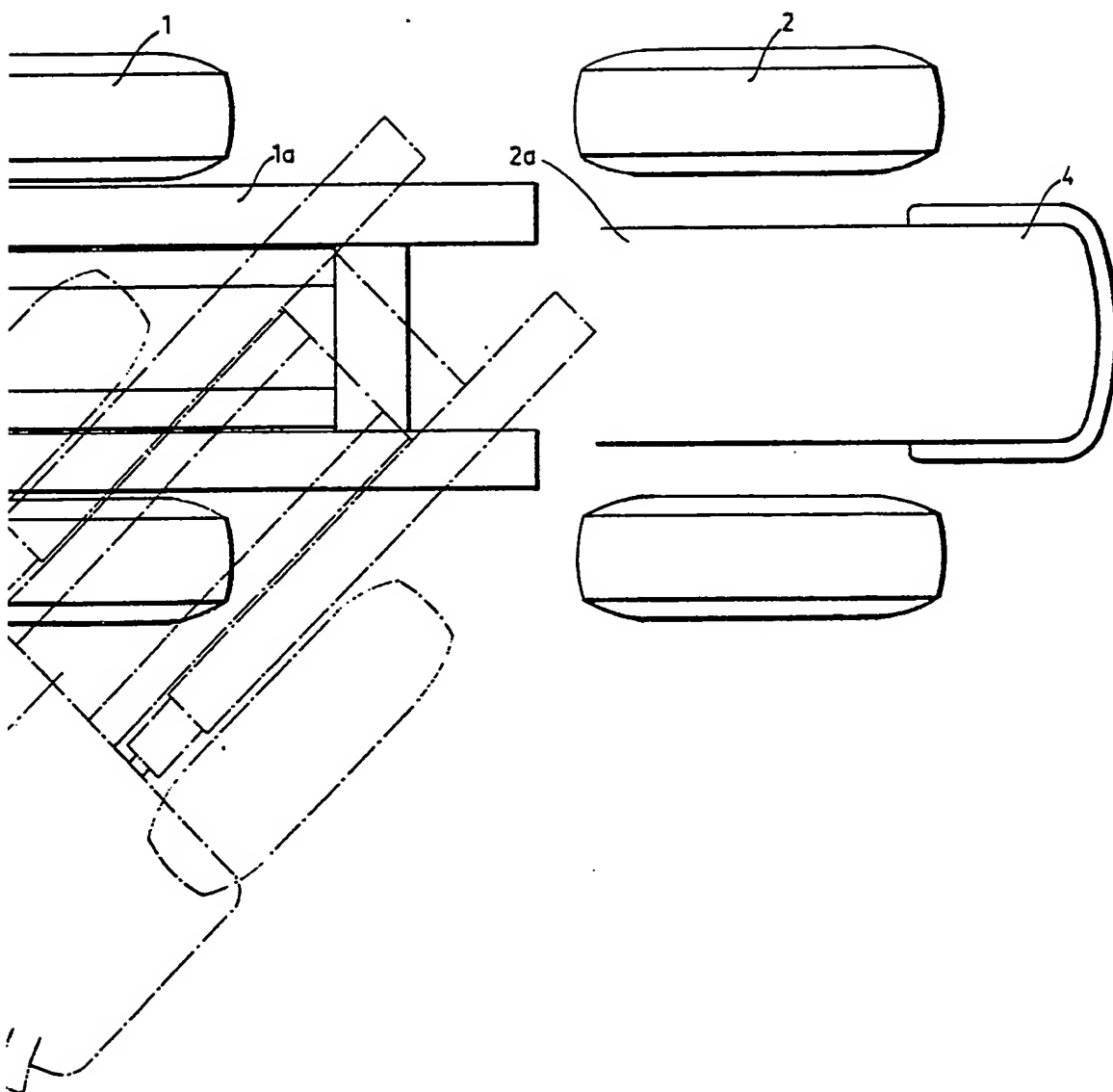


Fig. 2

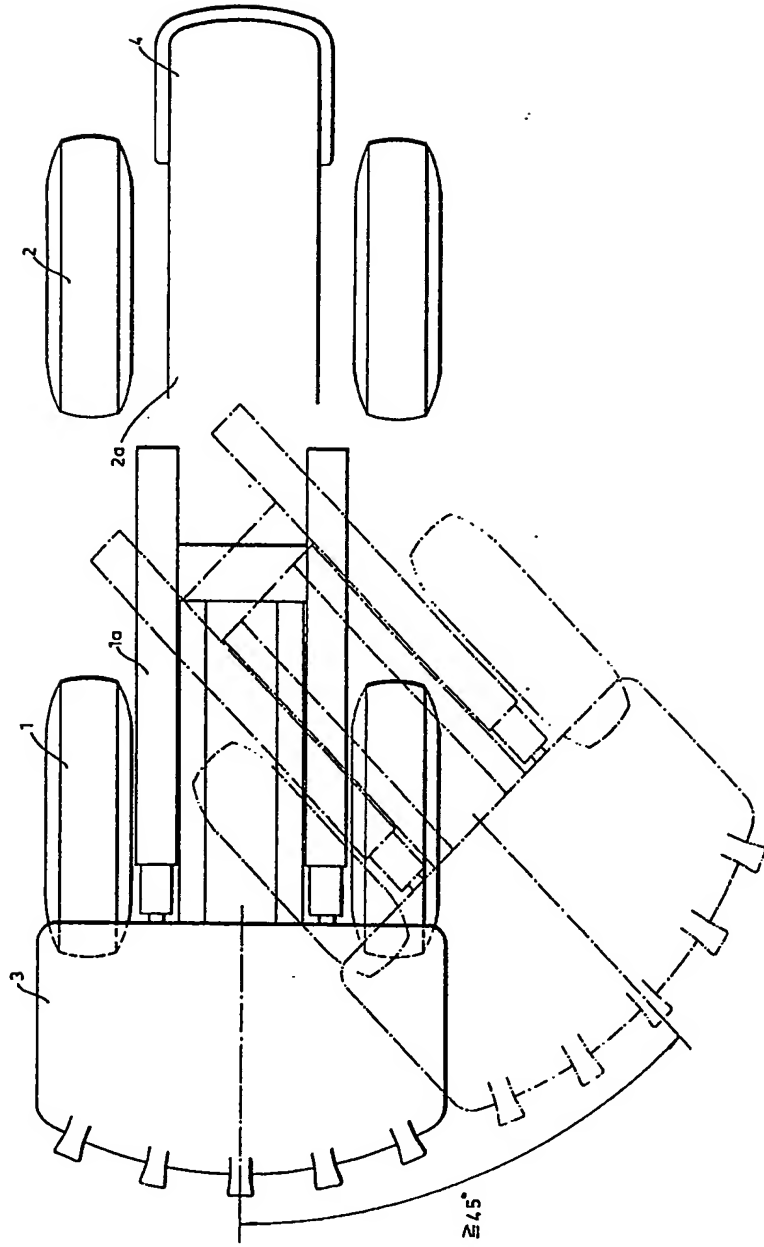


Fig.3

